Title: Mall Madness!

Brief Overview:

Students will take on the role of architects as each group designs a state-of-the-art store for a major shopping mall. They will be focusing on major mathematical concepts including measurement, scale factors, ratio and proportion, and area and perimeter.

Links to Standards:

- **Mathematics as Problem Solving**
  Students will demonstrate their ability to solve mathematical problems by concentrating on several skills. These skills include but are not limited to the following: Working cooperatively to design a floor plan for the actual store, discussing the size and shape of their store (area and perimeter) to meet their budget, and calculating the costs.

- **Mathematics as Communication**
  Students will demonstrate their ability to communicate mathematically by writing persuasive letters to the mall management to bid for their desired space in the mall. Students will also communicate as they discuss the ways to use the space in their stores.

- **Mathematics as Reasoning**
  Students will demonstrate their ability to reason mathematically as they compare the actual dimensions of their store to their scale drawings.

- **Mathematical Connections**
  Students will relate this project to the outside world by taking on the role of architects. They will have to make decisions regarding the shape of their store to meet their budget. This project also connects to real-life applications as students plan and complete a three dimensional version of their store. Students will have to consider the costs to complete the inside of their stores.

- **Geometry & Measurement**
  Students will use their knowledge of area, perimeter, measurement, scale factor, and money calculations to construct a store that meets their budget.

Grade/Level:

Grades 6-7

Duration/Length:

This activity will take 5 to 7 days.

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Measuring
- Computing area and perimeter
- Calculating costs.

Objectives:

Students will:

- work cooperatively to solve problems in constructing their stores.
- write a persuasive letter to convince the mall management to allocate a certain amount of space.
- make decisions regarding their store floor plan to meet their budget.
- measure the dimensions of the floor plan.
- construct a three-dimensional store built on their floor plan.
- decorate the interior of their stores using tiles, carpet, wallpaper, etc.
- place their individual stores on the classroom mall floor plan.

Materials/Resources/Printed Materials:

- Centimeter grid paper
- Pencils
- Stationary paper
- Tag board
- Rulers
- Glue
- Markers
- Worksheets 1-9
- Miscellaneous items (yarn, toothpicks, etc.)

Development/Procedures:

- Teacher will show the class an outline of a new shopping mall (on grid paper) that "will be opened" upon completion of the students' stores. (Worksheet 4, page 7)
- Teacher will review the concept of area and perimeter. This will be done as the class completes worksheets 1 and 2 and finds the area and the perimeter of the mall.
- Teacher will divide the class into cooperative groups of four based on gender, ethnicity, and academic levels.
- Each group will decide on a section of the mall to design their stores.
- Each group will write a persuasive letter to the mall management to rent out space.
- Each group will find the area and the perimeter of their designated space.
- Each group will use a reduced version of the mall floor plan to convert the dimensions to an actual measurement of the mall.
- Each group will receive grid paper to draw the floor plan of their store.
- Each group will chart their expenditures and calculate the costs of starting up their store.
- Each group will build a three-dimensional version of their store
- Each group will design the front and insides of their stores.
- Each group will present their stores to the class.
- Each group will place their stores on the floor plan of the classroom mall.
- Each group will fill out a cooperative group evaluation form.

Performance Assessment:

The groups will be evaluated based on a scoring rubric.

Extension/Follow Up:

- Students may interview local architects and invite them to speak to the class.
- Students may research famous architects and their buildings to share with the class.
- Students may research information on the process of actual mall constructions around the area.

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Worksheet 1

Name_____
Date_____
Group_____

FINDING PERIMETER WHEN AREA IS CONSTANT

I. Using the attached graph paper, draw four rectangles with area 24 square units. Find the perimeter of each and complete the chart below.

Area: 24 square units

Length	Width	Perimeter
1.		
2.		
3.		
4.		

II. Now draw six rectangles on your graph paper, each with 60 square units, and find the perimeter of each. Complete the chart below.

Length	Width	Perimeter
1.		
2.		
3.		
4.		
5.		
6.		

III. Compare your statistics and make some conclusions about the relationship between length, width, and perimeter.

1.

2.

Worksheet 2

Name_____
Date_____
Group_____

Finding Area When Perimeter Is Constant

I. Use the attached graph paper to draw 5 rectangles each with a perimeter of 24 units. Find the area of each rectangle and complete the chart below.

Perimeter: 24 units

	Length	Width	Area
1.			
2.			
3.			
4.			
5.			

II. Use the attached graph paper and a straight edge to draw 5 rectangles, each with a perimeter of 60 units. Find the area of each rectangle and complete the chart below.

Perimeter: 60 units

	Length	Width	Area
1.			
2.			
3.			
4.			
5.			

III. Compare your statistics and write some conclusions about the relationship among length, width, and area of a rectangle, given a constant perimeter.

1.

2.

Worksheet 3

Name_____
Date_____
Group_____

Congratulations! You have just been accepted into our apprentice program for architects! Move over I. M. Pei and Frank Lloyd Wright!

Your first project is to design shops and restaurants for a mini-mall. The plans for the mini-mall are page 7. You are to use your knowledge of area, perimeter, ratio, proportion and scale drawings to design a store or restaurant and draw a floor plan that coincides with the design on the following page.

Use the floor plan on the page 5 for steps 1, 2, and 3

Step 1: Use your ruler to measure each segment on the scale drawing and write the centimeter measurement under SCALE.

Step 2: Use proportions and the scale 1 centimeter = 20 feet to find the actual measurement of the mini-mall and write these under ACTUAL on the chart below.

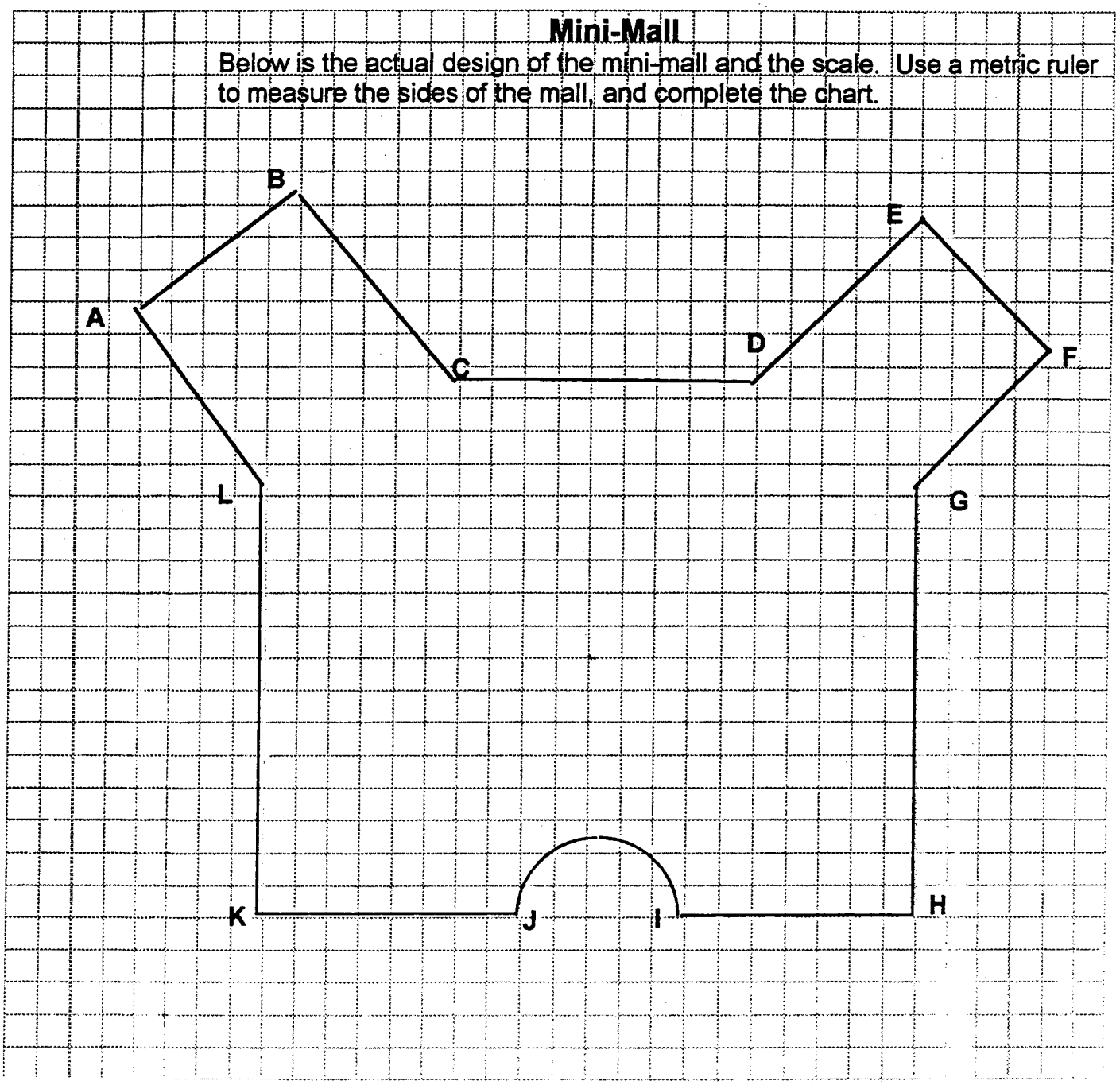
Step 3: Use the scale 2 centimeters = 3 feet to complete the dimensions for your model store and write these dimensions under MODEL on the chart.

WALL	SCALE	ACTUAL	MODEL
AB			
BC			
CD			
DE			
EF			
FG			
GH			
HI			
IJ			
JK			
KL			
LA			

WORKSHEET 4

Mini-Mall

Below is the actual design of the mini-mall and the scale. Use a metric ruler to measure the sides of the mall, and complete the chart.



Worksheet 5

Name_____
Date_____
Group_____

Problem Solving for Future Architects

1. Use the information on your chart on page 6, worksheet 3, to compute the entire area of the mini-mall. Show your computations below.

2. The cost of commercial construction is estimated $100 per square foot. Compute the cost of building the mall structure, disregarding parking facilities and landscaping.

3. Working with your group, decide what kind of store you would like to own in the mini-mall. Design your shop on the graph paper provided, using the same scale as the mini-mall plans. You may choose from one of the suggestions below or use your own idea. Use a ruler and design the basic floor plan for your store **to fit in the floor plan of the mall (worksheet 4).**

Suggested shops:	Video store	Department Store
	Restaurant	Women's Clothing Boutique
	Men's Store	Computer Store
	Eatery	Jewelry Store
	Coffee Shop	Pastry Shop
	Book Store	Shoe Store

4. Since several of you may be planning your store for the same space in the mall, you need to submit your basic floor plans to the mall management along with a letter explaining why you have chosen this space. Mall managers will allocate space according to your proposals and best interests of the general mall. Use Worksheet 6 as a guideline to write your persuasive letter.

Worksheet 6

Persuasive Letter to the Mall Management

Attention Architects!!!!

Write a persuasive letter to the mall management selling your plan for the mall. Be sure to include the following points:

*The name and type of store you designed.
*The space in the mall you would like to occupy.
*Reasons why your preferred space is best for your store.

Be sure to include a copy of your store plan.

Worksheet 7

Name_____
Date_____
Group_____

ARCHITECTS CORNER

1. Once your floor plan has been approved by the mall management, you need to design your space in greater detail. Use graph paper to design your floor plan, using the same scale as the mini-mall plans, 1 centimeter = 3 feet, paying attention to counter space, display space, isle space and anything else your group believes is necessary for the best interest of your future customers and to enable you to earn a profit.

2. Find the area of your shop.

3. What is the perimeter of your shop?

4. Find the cost of building your store using the same figure, $!00 per square foot.

5. Each shop will have to pay monthly fees to cover general maintenance, heating and cooling, and rest room use and cleaning. The managers will charge each store $5 per foot of perimeter plus $3 per square foot of floor space. What will be the monthly fee for your shop or restaurant?

Worksheet 8

Name_____
Date_____
Group_____

ARCHITECTS' SHOWCASE

The Grand Opening of your mini-mall is soon approaching. Use your floor plan and design your store from top to bottom. Design doors, windows, opening to mall and to outdoors if possible, counter space, isles, cashier area and any other details necessary. Then be creative and use card board, shoe boxes, wood and/or any supplies you feel reasonable and necessary to create a 3- dimensional scale of your store. Use the same scale as your submitted floor plan, 1 centimeter = 1 foot.

Of course, cost is always an important factor. **You have been allocated a $5000 budget for the interior of your retail space.** As you design you store or restaurant, pay attention to the price list on page 12 and tally your total cost.

Your grand design will be placed on the master floor plan of the mall so that all our apprentice architects can visualize the mall in completion and decide walkways, main entrance doors, restrooms, parking and landscaping and general mall design.

Be creative!

Be cost conscious!

Have fun!

Worksheet 9

COST SHEET

ITEMS	COSTS	QTY	PURCHASE PRICE	
CARPET	$40/SQ FT			
TILE	$250/B0X OF 100			
SHELVES	$80 - $100			
RODS	$5.00 PER ROD			
PAINT SUPPLIES	$25 PER GALLON			
WALL PAPER	$230 PER ROLL			
TOILET	$50-$120 EACH			
SINK	$40 PER SINK			
TOWEL RACK	$23 PER RACK			
CASH REGISTER	$600/REGISTER			
				SUBTOTAL
				TAX
				TOTAL
				TOTAL